previously published investigations into the theory of earthquakes" (p. 260). The reviewer may not have been able or not taken the trouble to distinguish the old from the new; but as a fact, the greater part of those forty-six pages is of matter never before published.

So also it is scarcely candid to object that "no reference is found to any of the Continental men of science who have done so much for terrestrial vulcanicity," which is contrary to the fact, for I have referred by name or by their labours to the few who have in any way advanced our knowledge as to the nature and origin of *volcanic heat*, without noticing that within that scope only was I by space obliged to confine myself, as stated in pp. 48, 49, 54, 76, &c.; the phenomena occurring at volcanic vents, which have chiefly engaged the attention of Continental and all other volcanic authors being avowedly outside my limits, and, I might add, but too often of secondary importance.

The nomenclature generally of my "Translation of Palmieri" is said to be objectionable, because such terms as sulphide of potass and terrochloride of ammonia are encountered. I have looked through the pages since without being able to discover these dreadful terms. However I am ready to take the reviewer's word that such a slip in proof correcting may be found in some place, and I humbly bow to such microscopic, profound, and valuable criticism, though, as stated, the conclusion is a good deal wider than its premises. ROBERT MALLET

Enmore, The Grove, S.W., March 5

Effect of Resistance in modifying Spectra

IN a review of M. Guillemin's work "The Forces of Nature" which appeared in last week's *Athenæum*, the following reference, by M. Guillemin, to the experiments of M. Mitscherlich is quoted: "Suivant ce physicien il arrive que la presence de certaines substances dans une flame a pour effet d'empecher de se produire les spectres des autres substances, d'enteindre leurs raies principales." The English editor adds that the effect "may probably be explained by the observations of Frankland and Lockyer."

In relation to this subject of the extinction of the bands of one metal by another, you will perhaps permit me to quote a paragraph from one of the lectures which I have recently had the honour of delivering in the United States. The arcs of thallium and silver had just been compared, and their similarity of colour pointed out. The power of prismatic analysis to show that, notwithstanding the apparent identity of colour, the arcs really belonged to two different metals, was then demonstrated. The metals were afterwards subjected *together* to the action of the Voltaic current, and it was shown that the band of thallium fell midway between the two bands of silver. Hence the similarity of colour. The lecture then proceeds thus:—

"But you observe here another interesting fact. The thallium band is at first far brighter than the silver bands; indeed the latter have wonderfully degenerated since the bit of thallium was put in. The reason of this is worth knowing. It is the *resistance* offered to the passage of the electric current from carbon to carbon that calls forth the heating power of the current. If the resistance were materially lessened, the heat would be materially lessened; and if *all* resistance were abolished there would be no heat at all. Now thallium is a much more fusible and vaporisable metal than silver, and its presence facilitates the passage of the current to such a degree as to render it almost incompetent to vaporise the more refractory silver. But the thallium is gradually consumed; its vapour diminishes, the resistance consequently rises, until finally the silver bands are rendered as brilliant as at first."

In the spectra of mixed substances derived from the electric spark the action here referred to must come frequently into play. If neither the fact, nor its proposed explanation, be new, I would thank you to commit this document to your waste-paper basket. JOHN TYNDALL

Royal Institution, March 1873

Perception in the Lower Animals

THE theory of taking olfactory notes by the way, as suggested by Mr. Wallace in explanation of the faculty possessed by animals of finding their way home, seems to meet with general acceptance amongst your correspondents; yet it totally fails to account for those instances in which the animal finds its way back by quite a different route to that by which it was taken away.

A good example is given by "F. R. G. S.," in the last number of NATURE; the anecdote of his riding-horse, by Mr. Darwin, also seems to illustrate this point. In an article on the "Consciousness of Dogs," in the *Quarterly Review*, of last October, the following remarkable instance, amongst others, is mentioned on indisputable authority. A hound "was sent by Charles Cobbe, Esq., from Newbridge, county Dublin, to Moynalty, county Meath, and thence, long afterwards, conveyed to Dublin. The hound broke loose in Dublin, and the same morning made his way back to his old kennel at Newbridge, thus completing the third side of a triangle by a road he had never travelled in his life."

Now as Mr. Wallace's theory does not explain these and similar instances, it clearly cannot be received as a solution of the question. Moreover, not only does the faculty exist in other animals not remarkable for their sense of smell, but we find it in cases where this sense has nothing to do with it. Take, for example, the direct homeward flight of the carrier pigeon. Under the same head may be brought the migrations of birds and fishes, and the habits of the turtle, as mentioned by Mr. Darwin.

The writer in the *Quarterly* suggests a sense of the magnetic currents of the earth—a sort of internal mariner's compass in fact. But it is difficult to see how this could have helped the dog to find its way from Dublin to Newbridge, for instance, unless it was also able to consult a map so as to ascertain the relative position of the two places.

It seems then that the problem still remains unsolved. Either we must extend almost indefinitely the range of smell and sight; or, we must suppose the existence of some peculiar sense of the nature of which we are ignorant, which enables its possessor to retain, as F. R. G. S. expresses it, "a constant perception of the bearing of its old home." J. T.

Bath, March 17

POSSESSION ISLES

AS the idea of occupying Possession Islands as a station for observing the Transit of Venus has been lately propounded, I have been requested to communicate to NATURE the results as to its climate, which we have obtained in this office from the logs of H.M.S. *Erebus* and *Terror*, which we are now re-discussing with a view to publication.

Possession Isles are in lat. 71° 56′ S., long. 171° 7′ E. H.M.S. *Erebus* and *Terror* were within lat. 70° to 72½° S, and long. 170° to 175° E. from 10th to 17th January, 1841. During these eight days the mean height of the barometer was 29·143, mean temperature of the air 29°·7, and of the sea 30°·5; the wind was variable, but chiefly from S. and SSW., force 6; the weather was clear ten times, cloudy twenty times, overcast eighteen times, from forty-eight double sets of four-hourly observations, while snow was noted nine times, and squally weather ten times.

The ships were within the same area on 20th and 21st February, 1841; and, during these two days, the mean height of the barometer was 28·920 inches, mean temperature of the air 23°·5, of the sea 30°·1; wind WSW. to SE., force 9 to 5; the weather was cloudy and overcast.

In addition I am permitted to enclose a letter from Dr. Hooker, which he kindly sent me in reply to my inquiries as to his reminiscences of his visit to these inhospitable regions, and which he has allowed me to publish.

Meteorological Office ROBERT H. SCOTT

Letter from Dr. Hooker

Possession Island, or rather Possession *rock*, is in a very inaccessible position. The chance of landing a well-equipped party upon it when reached, and the prospect of its subsequent removal by ships, if landed on, is very small. In any case I feel little uncertainty as to what would be the fate of a party left there for the winter, and the prospect of their seeing the transit would be absolutely *nil*.

To reach it we "took the pack" January 3, 1841, and had not penetrated it till the 9th, aided at last by a furious gale. We then discovered South Victoria, and traced its coast from lat. 70¾° to lat. 78°, without finding a spot where it was possible to approach the shore. During the

twenty-two days that we spent off that continent, we never effected a landing but twice, and then, with the greatest difficulty, on two small volcanic islets, without a particle of vegetation on them, of which one was Possession Island (Jan. 13), *a mere rock*. The ship was hove to two miles off; with the greatest risk a landing was effected, on a beach of large loose stones and stranded masses of ice. It was no sooner done than the recall flag was hoisted in the ships, which were reached just as a terrific fog came on, followed by a gale of wind; ten minutes more and all hands in the boats would have been lost, for the currents ran like sluices between the land, islets, and icebergs. So much for Possession Island. (Read Ross's account of the landing, i. 188, and especially the paragraph at p. 190.)

Take a glance at the meteorological registers in Ross's voyage for the month of January 1841, which was passed between S. lat. 66° 32′ and 78°. The mean temperature was 29°·02, max. 41°·5, min. 19°·5. It snowed on sixteen days; overcast, squally and misty was the usual weather, blue sky was rarely seen over more than a quarter of the heavens for a very few hours of the day, and for many days not seen at all.

In March between lat. 77° and 69½°, the mean temperature was 24°·28, max. 34°, min. 13°. Sky as in January.

In the following year our vessel went to the same seas. We "took the pack" December 17, and after being all but wrecked, penetrated it after fifty-six days of great peril, and proceeded to 78° S., never once seeing land.

During that January within 66° 32′, and 67° 21′ the mean temperature was 30°·46, max. 40°·5, min. 24°. It snowed on seventeen days, and we hardly ever saw blue sky.

In February between lat. 67° 18′ and 78° 12′, the mean temperature was 26°·68, max. 35°, min. 16°·5, and it snowed on twenty days. Blue sky was seen only on thirteen days. In 1842 the weather was worse than ever. In that year we tried to get south in the meridian a little east of Cape Horn, but never got beyond lat. 71½°, and then not till March 6th, having left the Falklands on the 18th December. In January of that year (1842) we were between lat. 63° 58′, and 64° 44′. The mean temperature was 30°·9, max. 45°, min. 23°·5. It snowed on sixteen days —sky as before.

February—between lat. 61° 37′ and 66° 01′. The mean temperature was 30°·50, max. 35°·5, min. 27°·5. It snowed on twenty-four days out of the twenty-eight! Blue sky was seen only on seven days, and this on six days over one-eighth of the sky, and on the 7th over one-fourth.

With such a midsummer climate I leave you to guess the position of a party in lat. 72°, cooped up through a winter on a rock a few yards long, covered with snow.

During the third year's cruise to the southward, Captain Crozier never once went to his cot, and we passed day and night with our hearts at the top of our throats.

The fact is, there is no summer or clear weather to be had, except by the rarest chance. For days and days we worked by Dead Reckoning alone. Storm, wind, and snow, are the prevalent summer phenomena. Still some seasons are not so bad as others, and Weddell got to 74½° in an open sea in the meridian where we barely reached 66°. (Signed) J. D. HOOKER

Royal Gardens, Kew, March 6

The following is the account of the landing alluded to by Dr. Hooker: —

"We found the shores of the mainland completely covered with ice projecting into the sea, and the heavy surf along its edge forbade any attempt to land upon it; a strong tide carried us rapidly along between this ice-bound coast and the islands amongst heavy masses of ice, so that our situation was, for some time most critical; for all the exertions our people could use were insufficient to stem the tide. But taking the advantage of a narrow opening that appeared in the ice, the boats were pushed through it, and we got into an eddy under the lee of the largest of the islands, and landed on a beach of large loose stones and stranded masses of ice. . . . . The island is composed entirely of igneous rocks, and only accessible on its western side. We saw not the smallest appearance of vegetation, but inconceivable myriads of penguins completely and densely covered the whole surface of the island, along the ledges of the precipices, and even to the summits of the hills, attacking us vigorously as we waded through their ranks, which, together with their loud coarse notes, and the insupportable stench from the deep bed of guano, which had been forming for ages, made us glad to get away again, after having loaded our boats with geological specimens and penguins. Owing to the heavy surf on the beach, we could not tell whether the water was ebbing or flowing; but there was a strong tide running to the south, between Possession Island and the mainland, and the *Terror* had some difficulty to avoid being carried by it against the land-ice. Future navigators should therefore be on their guard in approaching the coast at this place."

EARTHQUAKE WAVES

THE self-registering tide-gauges maintained by the United States Coast Survey at different points on the sea coast frequently exhibit, superimposed upon the tidal fluctuation, a succession of long waves, the origin of which is ascribed to distant earthquakes. In two notable instances, viz., the earthquake of Simoda in 1854, and that of Arica in 1868, the great ocean waves caused by the disturbance were distinctly registered in that way by the tide-gauges on the Pacific coast, and have been made use of for estimating the average depth along the lines of transmission. (See Coast Survey Reports for 1855, 1862, and 1869.)

Similar fluctuations were registered on the morning of November 17, 1872, shortly after local midnight, on the tide-gauge at North Haven, on the Fox Island, in Penobscot Bay, Maine. The fluctuations continued from midnight until nearly six o'clock in the morning, at somewhat irregular intervals of about seventeen minutes from crest to crest, with an average vertical range of nine inches, the greatest wave being at three o'clock, with a height of twenty inches.

No corresponding earthquake phenomena have come to the knowledge of the Coast Survey Office, and it is probable that if such was the case, the shock occurred somewhere under the Atlantic Ocean.

THE CHALLENGER EXPEDITION

H.M.S. *Challenger* cast off from the jetty at Portsmouth at 11.30 A.M. on December 21, with a low barometer. A strong south-westerly breeze was blowing, and the drum up; so that, especially in a season like the present, the prospect was not promising for the first few weeks of her voyage round the world.

The result justified the drum, and for a week we were knocking about the mouth of the Channel, and the Bay of Biscay, making slow progress southwards. It was perhaps as well to get a good shaking at first. It showed at once where there was a screw loose, and gave a chance to tighten it up. A sharp cyclone which caught the ship on her way from Sheerness to Portsmouth had already tested pretty fully the stowing of the apparatus, and although the *Challenger* rolls considerably when she is put to it (over 35°), not a single instrument shifted, and not a glass was broken, either in the zoological workroom, or in the chemical laboratory. Just before we got to Lisbon the weather improved a little, and we got some soundings and took one or two trial hauls with the dredge.

After leaving Lisbon on January 12 the wind was again fresh, but between Lisbon and Gibraltar we made some important experiments, and found, among other things, that we could work easily and successfully with the common trawl down to 600 fathoms. I am now writing about 100 miles north of Madeira, and since leaving Gibraltar the weather, though at first breezy, has been on